DERWENT-ACC-NO: 2000-489994

DERWENT-WEEK: 200044

TITLE: Textural dividing method for color document can separate a figure from text part in a color document or an advertisement brochure for subsequent processing according to different data characteristics

INVENTOR: JIUH, J; LIN, W ; WU, B

PRIORITY-DATA: 1998TW-0115124 (September 11, 1998)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
TW 376670 A	December 11, 1999	N/A	018	H04N 009/78

INT-CL (IPC): H04N009/78

ABSTRACTED-PUB-NO: TW 376670A

BASIC-ABSTRACT:

The textural dividing method for a color document can separate a figure from text part in a color document or an advertisement brochure for subsequent processing according to different data characteristics. The techniques used

involves: (a) searching for figure and text blocks; (b) extracting three characteristic parameters of the number of **colors**, projection **histogram**, and fractal dimension in the image; (c) using **fuzzy** rules to obtain the attribute function of the three parameters obtained in step (b) and fuzzifying the attribute function, and defuzzifying the result by built-in **fuzzy** rules thereby separating the figure part from the text part in the image to complete the textural division of the image data.

---------- KWIC ---------

Basic Abstract Text - ABTX (1):

The textural dividing method for a color document can separate a figure from text part in a color document or an advertisement brochure for subsequent processing according to different data characteristics. The techniques used involves: (a) searching for figure and text blocks; (b) extracting three characteristic parameters of the number of **colors**, projection **histogram**, and fractal dimension in the image; (c) using **fuzzy** rules to obtain the attribute function of the three parameters obtained in step (b) and fuzzifying the attribute function, and defuzzifying the result by built-in **fuzzy** rules thereby separating the figure part from the text part in the image to complete the textural division of the image data.

US-PAT-NO: 6211971

DOCUMENT-IDENTIFIER: US 6211971 B1

TITLE: Method and apparatus to compress multi-spectral images to a single color image for display

DATE-ISSUED: April 3, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Specht; Donald F.	Los Altos	CA	N/A	N/A

APPL-NO: 09/ 265866

DATE FILED: March 11, 1999

US-CL-CURRENT: 358/1.9, 345/589 , 382/156 , 382/157 , 382/162 , 382/167 , 382/274

ABSTRACT:

A method and apparatus enhance visible contrast within an acquired image for display. The contrast enhancement utilizes all N bands of an original N-band spectral image to produce an M-dimensional enhanced image for display. The method creates an enhanced image from an original image in which the visible contrast in the original image is improved. The original image includes

graphically in the scatter plots of pixel data shown in FIGS. 3A and 3B. A scatter plot of raw pixel data usually shows that pixel intensities do not span the entire range of the red, green, and blue color palette which can be displayed on a standard color monitor 20 or printer 18. Even after conventional **histogram** equalization of each **color** plane separately, the scatter plot in three dimensions may appear as shown in FIG. 3A. In this figure, there is a high correlation among the three colors. The pixel concentration is along the main diagonal of the RGB color cube or M-dimensional display space, and each point is represented as a shade of gray but with a tinge of color. For purposes of contrast enhancement, it would be desirable to spread these pixels away from the main diagonal to make better use of the full range of colors which can be displayed. If the pixel distribution in FIG. 3A were spread out to the distribution of FIG. 3B, for example, subtle differences of color would be exaggerated into larger differences of color which would make them easier to discern. There are several ways to accomplish this, which illustratively include: using neural networks, such as an input trained general regression neural network (IT-GRNN), an input trained back-propagation neural network (IT-BPNN), and an auto associative neural network (AANN); using **fuzzy** logic to describe how each pixel value should be changed iteratively to spread the scatter plot; using Kohonen self organizing maps; and perpendicular expansion

to name a few.

PAT-NO: JP02002042055A

DOCUMENT-IDENTIFIER: JP 2002042055 A

TITLE: METHOD FOR CHARACTER EXTRACTION FROM COLOR DOCUMENT IMAGE

PUBN-DATE: February 8, 2002

INVENTOR-INFORMATION:
NAME COUNTRY
OKAMOTO, MASAYUKI N/A

ASSIGNEE-INFORMATION:
NAME COUNTRY
JAPAN SCIENCE & TECHNOLOGY CORP N/A

APPL-NO: JP2000222063

APPL-DATE: July 24, 2000

INT-CL (IPC): G06K009/20, G06T001/00 , G06T005/00 , G06T007/00 , H04N001/60 , H04N001/40 , H04N001/46

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method for character extraction from

color document image that can separate the background color and the character color of an image and extract characters even from a complex and varied background by clustering the color information.

SOLUTION: The method for character extraction from **color** document image, which extracts only character **color** portions from a **color** document image with a complex and varied background, removes dithers by smoothing from the **color** document image, converts the **color** values of the dither-removed image from the RGB system to the L*u*v* system and prepares a **histogram** thereof, clusters the **color** information on a **fuzzy** basis, prepares **color**-separated images (binary images) according to the degree of assignment, removes noise from the binary images, provides labels to black pixels and white pixels, then selects a binary image suitable for character extraction, and extracts a line of characters.

US-PAT-NO: 5489997

DOCUMENT-IDENTIFIER: US 5489997 A

TITLE: Color image processing apparatus

DATE-ISSUED: February 6, 1996

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Usami; Akihiro	Yokohama	N/A	N/A	JP

APPL-NO: 07/ 797967

DATE FILED: November 26, 1991

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	2-326457	November 27, 1990
JP	3-307799	November 22, 1991

US-CL-CURRENT: 358/522, 358/487 , 358/501 , 358/506 , 358/518 , 358/523 , 358/524

ABSTRACT:

A color image processing apparatus includes a storage device for storing input image data for one frame and a discriminator for analyzing the color image data stored in the storage device. In the

color image processing
apparatus, the discriminator discriminates the type
of the stored color image
data utilizing a membership function.

22 Claims, 19 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

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Detailed Description Text - DETX (6):
In this embodiment, **histograms** of the
above-mentioned divisional **color**
spaces are formed so as to deduce the type of an
image stored in the memory 1.
In this embodiment, the following **fuzzy** deducing
rules are prepared.

US-PAT-NO: 6639998

DOCUMENT-IDENTIFIER: US 6639998 B1

TITLE: Method of detecting a specific object in an image signal

DATE-ISSUED: October 28, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lee; Jin Soo	Seoul	N/A	N/A	KR
Kim; Hycon Jun	Kyonggi-do	N/A	N/A	KR

APPL-NO: 09/ 480111

DATE FILED: January 10, 2000

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
KR	1999/425	January 11, 1999
KR	1999/2016	January 22, 1999
KR	1999/4358	February 9, 1999

US-CL-CURRENT: 382/103, 382/165 , 382/190 , 382/209

ABSTRACT:

A method of detecting a specific object in an image signal both efficiently

and accurately is disclosed. According to the present invention, an object is first detected from an image or frame using a general feature of the object and in the following image or frame, the object is detected using an object-dependent feature. Also, when detecting a plurality of objects or portions of the object, a full color range of the specific object is determined, and color range sections of the full color range is used to detect the object.

30 Claims, 33 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 16

---------- KWIC ---------

Detailed Description Text - DETX (36):
In another embodiment of the present invention, color is extensively utilized to detect an object. A typical application field for specifying a color range of the specific object to be detected is in the field for searching a face or hand by specifying the skin color. In the related art, a method specifies a skin color region by converting the color space of RGB into a color space of YIQ and detects the region of hand accordingly. Another method in the related art converts the skin color range in L*a*b color space using the principle component analysis and detects the skin color region using the

converted skin color range. Still, another method in the related art
calculates the possibility that a specific color is the skin color using a
fuzzy set.

Detailed Description Text - DETX (38):
FIG. 10 is a flowchart of an object detection process according to a third
embodiment of the present invention. Referring to FIG. 10, when detecting the
specific object from an input image frame, the detection system divides the
full color range (W) of an object to be detected into a plurality of sections,
R1 to R6 as shown in FIG. 9 (step ST101). The system obtains a **color** image by
detecting **colors** of the input frame which satisfies a **color** range condition of
the first **color bin** R1, i.e. a I-th **color bin**
(steps ST102 and ST103).
Thereafter, the detection system detects the object from the obtained color
image and confirms the object using a general confirmation algorithm (step
ST104). The detection system then compares and identifies whether the current
section is the last **color bin,** i.e. section R6
(step ST105). If the current
section level is the last level, the detection system terminates the process.
Otherwise, the detection system increases a count value and returns to step
ST103 (step ST106).

Detailed Description Text - DETX (40):
Furthermore, in the above embodiment, the full **color** range was divided into

six **color bins** R1 to R6 as shown in FIG. 9. However, the full **color** range may be divided into more or less **color bins** as necessary. Also, a brightness component is used as the basis for dividing the full color range (W). Accordingly, when detecting the face region by using the color of the face region, the relative brightness of the skin color can be considered, and the accurate and effective detection of the object region is possible.

US-PAT-NO: 5652881

DOCUMENT-IDENTIFIER: US 5652881 A

TITLE: Still picture search/retrieval method carried out on the basis of color information and system for carrying out the same

DATE-ISSUED: July 29, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Takahashi; Masamitsu	Hadano	N/A	N/A	JP
Yanagi; Kunihiro	Sagamihara	N/A	N/A	JP
Iwai; Noriyuki	Yokohama	N/A	N/A	JP

APPL-NO: 08/ 346301

DATE FILED: November 23, 1994

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	5-293426	November 24, 1993

US-CL-CURRENT: 707/104.1, 358/403 , 382/162 , 382/165 , 382/181 , 382/305 , 707/3 , 707/5

ABSTRACT:

Still picture search/retrieval method and system for retrieving a still picture without omission by extracting representative color component from a location of the still picture which includes a thing for search. A search condition input processing module receives color information constituting a search condition via an input unit. A still picture dividing method determination processing module receives via the input unit a method for dividing the still picture into rectangular meshes of a same size. A divided mesh designation processing module receives designation of a mesh for search from those resulting from the division. Still picture information is read out from a database for dividing each still picture into meshes by a still picture division processing module. A representative color component extraction processing module extracts a color component having the highest frequency of histogram within the search-destined mesh. A search execution processing module evaluates the representative color component to determine an evaluation value. A still picture having the evaluation value exceeding a threshold value is retrieved as the search result. The retrieved still picture is displayed on a display unit through a searched still picture display processing module.

11 Claims, 33 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 20

---------- KWIC ---------

Claims Text - CLTX (72):

a memory including an area for storing **color** gradation division numbers, a table for storing representative gradation values for said **color** gradation divisions, respectively, a **fuzzy** flag area having a flag indicating whether or not a **fuzzy** influence is to be employed in executing the search for the purpose of enabling still pictures of **colors** approximating the designated **color** to be retrieved, a table for storing **fuzzy** grades of inputted **color** components, respectively, when said **fuzzy** inference is to be employed for the search, a table for storing inputted gradation values serving as the representative **color** components when said **fuzzy** inference is not employed in the search, a still picture division information storing table for storing divisors for dividing the still picture in the vertical (heightwise) direction and in the horizontal (widthwise) direction, respectively, an area for storing locations of the designated regions in terms of identifier numbers, respectively, a table for storing the gradation values at starting points and end points of several ranges into which the **color** component gradation is to be divided, an evaluation table for storing Cartesian products of **fuzzy** sets inputted, a still picture information table for storing file names of still pictures extracted from a database, a search-destined mesh picture

information table for storing still picture data of the search-destined meshes cut out from said still picture data, a frequency table for storing values of **histogram**, an area for storing an evaluation value corresponding to the representative **color** component value read out from said evaluation table, an area for storing a threshold value serving as a reference value for the search and determined previously in said system, and a search result table for storing results of the search; and

US-PAT-NO: 5652831

DOCUMENT-IDENTIFIER: US 5652831 A

TITLE: Variable point interpolation apparatus and method with scalable architecture for color correction

DATE-ISSUED: July 29, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Huang; King-Lung	Hsinchu Hsien	N/A	N/A	TW
Chen; Henry	Hsinchu Hsien	N/A	N/A	TW

APPL-NO: 08/ 595557

DATE FILED: February 1, 1996

US-CL-CURRENT: 345/604

ABSTRACT:

A variable point interpolation apparatus with scalable architecture for color correction and a method of the same are disclosed. The color correction apparatus is capable of transforming color image data from a first color space to a second color space and comprises: an appearance equivalent scalable computing means for analyzing the **color characteristic of the image data from**

the first color space and dividing an interpolation input signal of the image data into upper bits and lower bits in which numbers of the upper bits and the lower bits are adjustable; a **fuzzy** variable point interpolation computing means for determining automatically a proper number of interpolation reference points; a non-uniform three-dimensional look-up table, wherein variations of distances between any two reference values of knot points in the non-uniform three-dimensional look-up table are non-uniform.

18 Claims, 13 Drawing figures

Exemplary Claim Number: 7

Number of Drawing Sheets: 8

---------- KWIC ---------

Abstract Text - ABTX (1):

A variable point interpolation apparatus with scalable architecture for color correction and a method of the same are disclosed. The color correction apparatus is capable of transforming color image data from a first color space to a second color space and comprises: an appearance equivalent scalable computing means for analyzing the **color characteristic of the image data from the first color** space and dividing an interpolation input signal of the image data into upper bits and lower bits in which numbers of the upper bits and the lower bits are adjustable; a **fuzzy** variable point

interpolation computing means for determining automatically a proper number of interpolation reference points; a non-uniform three-dimensional look-up table, wherein variations of distances between any two reference values of knot points in the non-uniform three-dimensional look-up table are non-uniform.

Brief Summary Text - BSTX (13):

Another aspect of the present invention is using a **Fuzzy** variable point interpolating method which quickly quantizes the color coordinate and determines the local attribute in **color space for the data characteristic** of an input image. The local attribute determines a built-in appearance tolerance. Thereafter, the color tolerance factor (C.T.F.) of the image data can be determined by membership function. The number of the closest reference points being used for interpolation computation can then be determined in accordance with the color tolerance factor and the appearance tolerance.

Detailed Description Text - DETX (24):

Referring to FIG. 9, another preferred embodiment of the present invention is capable of establishing different look-up tables complying with different correcting rules for different applications. In this embodiment, **color character** computing means 310 and **fuzzy** membership weighting function computing means 320 are respectively employed instead of the appearance equivalent

scalable computing means 110 and the **fuzzy** variable point interpolation computing means 120 shown in FIG. 1. The apparatus shown in FIG. 9 further comprises selecting means 330. The other components are the same as shown in FIG. 1. Wherein, the color character computing means 310 can analyze the color character of input image data to decide the dividing ratio of the upper/lower bits. The fuzzy membership weighting function computing means 320 can perform membership function weighting computation according to different correcting rules to determine the number of interpolation points. And the selecting means 330 selects the use of different three-dimensional color look-up tables in accordance with different correcting rules.

Claims Text - CLTX (13):

a **fuzzy** variable point interpolation computing means for receiving the image data from the plurality of buffers, quantizing color coordinates of the image data and determining local attributes of the first **color space according to the color characteristic** of the image data, determining a built-in appearance tolerance by the local attribute, and determining a color tolerance factor of the image data according to membership functions built by an expert system, then determining numbers of reference points needed to perform interpolation computing in accordance with the color tolerance factor and the built-in appearance tolerance;

US-PAT-NO: 6385337

DOCUMENT-IDENTIFIER: US 6385337 B1

TITLE: Method of selecting colors for pixels within blocks for block truncation encoding

DATE-ISSUED: May 7, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Klassen; R. Victor	Webster	NY	N/A	N/A

APPL-NO: 09/ 217209

DATE FILED: December 21, 1998

US-CL-CURRENT: 382/166, 382/266

ABSTRACT:

A method and apparatus for selecting colors for blocks for use in a Block truncation Coding scheme is disclosed. The method includes finding the largest cluster of pixels and selecting that color for the first color in the block. The average color of the remaining pixels is assigned to the second color. The invention may be applied in iterative fashion if more than two colors are to be assigned to the block.

6 Claims, 7 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

---------- KWIC ---------

Detailed Description Text - DETX (9):

This far the invention has been described, for simplicity, using conventional histogram analysis. In the preferred embodiment, a "**fuzzy**" histogram is used. In a conventional histogram, values are assigned to "bins", with the counter for a bin being incremented each time a value in the range associated with that bin is encountered. Ranges for the bins are non-overlapping, and together the full set of ranges make up the range of values being histogrammed. In a **fuzzy** histogram such as used in this invention, values are assigned to all bins within a certain radius. In one dimension, this means that all **bins** within a given range centered on the value of the current **colour** would have their counters incremented. Thus if the range is +/-10, and the bin width is 16, a value of 33 would cause the counters for bins 2 and 3 to be incremented, corresponding to ranges 16-31 and 32-47, while a value of 40 would cause the counters for bins 2, 3 and 4, corresponding to ranges 16-31, 32-47, and 48-63, to be incremented.

US-PAT-NO: 6272239

DOCUMENT-IDENTIFIER: US 6272239 B1
See image for Certificate of Correction

TITLE: Digital image color correction device and method employing fuzzy logic

DATE-ISSUED: August 7, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Colla; Federica	Crema	N/A	N/A	IT
Mancuso; Massimo	Monza	N/A	N/A	IT
Poluzzi; Rinaldo	Milan	N/A	N/A	IT

APPL-NO: 09/ 222247

DATE FILED: December 28, 1998

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
EP	97830730	December 30, 1997

US-CL-CURRENT: 382/167, 362/171

ABSTRACT:

A digital image color correction device and method employing fuzzy logic, for correcting a facial tone image portion of a

digital video image is
provided. The device is a pixel fuzzifier unit (1)
receiving in input a stream
of pixels belonging to a sequence of correlated
frames of a digital video image
and computing a multilevel value representing a
membership of each pixel to a
skin color class; a global parameter estimator (2)
receiving in input each of
said pixel and the relative membership value, and
computing a first and a
second parameter which define the characteristics
of a portion of said image
that belongs to said skin color class; a processing
unit (3) connected
downstream to said global parameter estimator and
to said pixel fuzzifier unit
and adapted to correct each of the pixels of said
portion of the image that
belongs to said skin color class, according to said
first global parameter
(300), to obtain corrected pixels; and a processing
switch (4) for outputting
said pixels or said corrected pixels according to
said second global parameter
(400).

29 Claims, 9 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

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Detailed Description Text - DETX (10):
First a mean operator is applied on the image
and the membership values of
each pixels are calculated. To identify the

parameters of the corrections some other membership functions are used. These functions, as shown in FIG. 4, relate to different levels of saturation and value (low, medium and high).
Once we have the membership value of each pixel for these **fuzzy** sets, it is possible to obtain some **indexes concerning the degree of and value inside the skin color** class.

US-PAT-NO: 6625308

DOCUMENT-IDENTIFIER: US 6625308 B1

TITLE: Fuzzy distinction based thresholding technique for image segmentation

DATE-ISSUED: September 23, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Acharya; Tinku	Chandler	AZ	N/A	N/A
Ray; Ajay K.	West Bengal	N/A	N/A	IN
Rao; A. K. V. Subba	West Bengal	N/A	N/A	IN

APPL-NO: 09/ 393017

DATE FILED: September 10, 1999

PARENT-CASE:

RELATED APPLICATION

This patent application is related to concurrently filed U.S. patent application Ser. No. 09/393,136, entitled, "A FUZZY BASED THRESHOLDING TECHNIQUE FOR IMAGE SEGMENTATION," by Acharya et al., filed on Sep. 10, 1999, assigned to the assignee of the current invention and herein incorporated by reference.

US-CL-CURRENT: 382/168, 382/164 , 382/170 , 382/171 , 706/8 , 706/900

ABSTRACT:

Embodiments of a fuzzy distinction based thresholding technique for image segmentation are disclosed. In one embodiment, at least one signal value level of the image is determined along which to divide a fuzzy histogram, the histogram being based, at least in part, on the image. The signal value represents a value which produces a divided fuzzy histogram with an extreme value of one of distinctiveness and fuzziness based on a measure of multidimensional distance between measurement distributions and their respective complements. The image is then segmented using the at least one signal value.

30 Claims, 6 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

---------- KWIC ---------

Detailed Description Text - DETX (20):

Of course, a variety of segmentation approaches may be employed for color images. For example, where the color space format of the image comprises a three-color plane color space format, such as the YUV color space format of the RGB color space format, a variety of techniques may

be employed, although the invention is not limited in scope to these techniques or to employing color images or three-color plane color space formats. Nonetheless, in one embodiment, a **fuzzy histogram** may be produced for each **color** space, and the pixel signal value employed may be based, at least in part, on all three. Likewise, the color image may be segmented by segmenting all three color space planes of the image. Alternatively, a **fuzzy histogram** may be produced for any one of the **color** space planes or for only a selected one of the **color** space planes, and, again, all three **color** space plane images of the **color** image may be segmented. Of course, additional variations are also possible and within the scope of the present invention. Alternatively, an image may be represented in YUV color space format where the Y component contains luminance signal information about the image. Thus, the previously described embodiment may be applied to the Y component of the image to produce a segmented characterization of the color image.

Patent Assignment Abstract of Title

Total Assignments: 1

Application #: 09737531 **Filing Dt:** 12/13/2000 **Patent #:** NONE **Issue Dt:**

PCT #: NONE **Publication #:** 20020102018 **Pub Dt:** 08/01/2002

Inventors: Siming Lin, Dinesh Nair, Darren Schmidt

Title: System and method for color characterization using fuzzy pixel classification with application in color matching and color match location

Assignment: 1

Reel/Frame: 011422/0286 **Received:** 01/17/2001 **Recorded:** 12/13/2000 **Mailed:** 03/27/2001 **Pages:** 3

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Assignors: LIN, SIMING **Exec Dt:** 11/22/2000

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